

Subject: Mannella colloq., 2/9/06, 212, A157, 11am
From: Janice Coble <coble@msd.anl.gov>
Date: Thu, 02 Feb 2006 09:03:05 -0600
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SPEAKER: NORMAN MANNELLA
Stanford University

TITLE: Nodal Quasiparticle in Pseudogapped
Colossal Magnetoresistive
Manganites

DATE: Thursday, February 9, 2006
TIME: 11:00 a.m.
PLACE: Building 212, Room A157

HOST: Ken Gray

Refreshments will be served at 10:45 a.m.

Abstract: Colossal magnetoresistive (CMR) manganites are prototypical strongly correlated materials which have attracted a lot of attention since they exhibit the colossal magnetosistive effect, i.e. the large increase of electrical conductivity upon application of a magnetic field.

In this talk, I will discuss the result of some recent angle-resolved photoemission spectroscopy (ARPES) investigations which allowed elucidating the controversial nature of the ferromagnetic metallic groundstate in the prototypical bilayer compound $\text{La}_{1.2}\text{Sr}_{1.8}\text{Mn}_2\text{O}_7$ (LSMO) [1]. The distribution of spectral weight in momentum space exhibits a nodal–antinodal dichotomous character. Quasiparticle excitations have been detected for the first time along the nodal direction (i.e. diagonal), and they are found to determine the metallic transport properties of this compound. These nodal quasiparticles coexist with strong anisotropic electron-boson interactions. The weight of the quasiparticle peak diminishes rapidly while crossing over to the antinodal (i.e. parallel to the Mn–O bonds) parallel sections of the Fermi surface. In particular, the spectra along the antinodal straight sections of the Fermi surface strongly resemble those found in heavily underdoped cuprates high temperature superconductors such as $\text{Ca}_{2-x}\text{Na}_x\text{CuO}_2\text{Cl}_2$ [2].

This dichotomy between the electronic excitations along the nodal (diagonal) and antinodal (parallel to the Cu–O bonds) directions in momentum space was so far considered a characteristic unique feature of the copper oxide high-temperature superconductors. These findings therefore cast doubt on the assumption that the pseudogap state in the copper oxides and the nodal-antinodal dichotomy are hallmarks of the superconductivity state. The relevance of these findings to the physics of strongly correlated oxides will be discussed.

[1] N. Mannella et al., Nature 438, 474 (2005)

[2] K. M Shen et al., Science 307, 901 (2005).